

IAA Study Group Status Report

Responsible Commission:

- **IAA Commission 4: Space Systems Operations and Utilization**

Study Number and Title:

- **S.4.1. Knowledge Management of Space Systems**

Short Study Description

- Define the organizational and inter-organizational issues that support or inhibit knowledge sharing amongst aerospace organizations (including capturing knowledge of our key experts and aging workforce)
- Identify and recommend standards for knowledge management activities and initiatives to promote interoperability of key systems (such as lessons learned or publications)
- Create, through consensus, a position on the recommended approaches for an aerospace organization to investigate to excel at knowledge management

Website Study Information up to date?

- Yes

Issues requiring resolution?

- The establishment of the International Conference on Managing Knowledge for Space Missions and publishing of the Enabling Knowledge Sharing Across Space Organizations: Development of an International Space Ontology are the final deliverables of this Study Group.
- **Recommend closure of this group following the public review for comments of the Ontology paper in November.**

Progress and Product Deliveries on Schedule?

- **Plan:** Support a better understanding among member and aerospace organizations of the ways in which they can share knowledge
- **Action (ongoing):** The Third *International Conference on Managing Knowledge for Space Missions* took place at the European Space Operations Center (ESOC) during 21-23 June 2010. The conference addressed the methodology, technology and architectural challenges of capturing, organizing, and sharing knowledge within and among space missions.
 - Objectives

- Establish a forum for global aerospace community to discuss current activities in knowledge management and share best practices
 - Share and bring focus to applied KM activities, tools and processes oriented towards space missions
 - Formulate recommendations for further KM activities
 - The conference was attended by almost 100 participants coming from 12 nations.
 - The conference is the third one of a series, which was initiated by NASA's Jet Propulsion Laboratory in 2007. The conference was co-chaired by Roberta Mugellesi-Dow of ESOC and Jeanne Holm of JPL. However, this 2010 conference was the first one outside of the United States and it was organized by the ESOC Knowledge Management Core Team, composed of representatives of the main technical domains and responsible for guiding and promoting the knowledge management initiative as well as developing a knowledge management strategy for the Directorate. ESOC is located at Darmstadt, Germany, and is an establishment of the European Space Agency (ESA) responsible for the operations of the ESA satellites.
 - Web site developed for Conference: <http://www.congrex.nl/10c11/>
 - During the three days of the conference, 49 presentations were given by space organisations (such as NASA, CNES, DLR, and ESA) and by space industry companies coming from 11 countries from three continents. The list of presentations included several invited lectures.
 - Dr. Jay Liebowitz gained wide experience in knowledge management within NASA/GSFC, John Hopkins University, and the University of Maryland. Recently he was ranked one of the top 10 knowledge management researchers out of 11,000 worldwide. He talked about "Exploring Knowledge Management Methodologies: Present and Future Trends."
 - Dr. Klaus North is a professor of International Management at Wiesbaden Business School and the founder of the German Knowledge Management Association. His book "Knowledge Oriented Business Management" is the leading textbook on knowledge management in the German language. He talked about "Knowledge Management Approaches and Practices – An Overview."
- **Plan:** A position paper on the recommended approaches for an aerospace organization to follow in knowledge management that would promote knowledge sharing and interoperability with other organizations
 - **Action:** As international collaboration in space increases across government and industry, the challenge arises in integrating information from multiple languages, disciplines, and missions. To date, this has been a laborious process that must be managed for each

mission and international partner. The IAA Knowledge Management for Space Activities Study Group has published the first International Ontology for Space under as "Enabling Knowledge Sharing Across Space Organizations". This provides a single format for people to use in organizing the data on a mission and allows other organizations to easily integrate to that single format. The ontology describes the categories of activities, products, science data, and other types of information that is collected, used, and managed within a space mission. Each of these is also shown in relation to other items. For example, an image of Mars that is collected would be organized in such a way that it shows the mission, spacecraft, instrument, researcher, and papers that are related to it.

- The approach has been to allow "federation" of multiple existing and emergent ontologies that have been developed by organizations all across the world. Each portion of the ontology can be managed by different agencies or from different countries to allow a diversity of views to be represented and integrated.
 - The ontology represents the work of individuals from many countries, agencies, industry, and academia. The work is published in a paper, but more importantly will be released this fall on a web site that allows ongoing updates and contributions to expand the work and continue to make it relevant to space organizations.
- **Action (ongoing):** Continue to co-lead a consortium of US aerospace industry, academia, and government space organization meetings on knowledge management. Team meets face-to-face 4-6 times a year. Participants include Northrop Grumman, The Aerospace Corporation, Boeing, Pratt Whitney Rocketdyne, Lockheed Martin, Raytheon, Pepperdine University, California State University at Northridge, and NASA.
 - This team sponsored a National Knowledge Management Conference on September 1, 2010, at Pepperdine University in Malibu, California. There were 125 participants.
 - The information can be found at <http://bschool.pepperdine.edu/events/knowledge-management-conference/>
 - **Plan:** Ensure that after this Study Group concludes, there is an ongoing entity to coordinate the KM track.
 - **Action:** IAF KM for Space Organizations Technical Committee held the first meeting on 23 March 2010
 - **Plan:** Ensure that there is a set of related papers from workshop participants at the 2010 IAC that exemplifies excellent knowledge management practices at aerospace organizations.

- **Action:** Continue to have combined Knowledge Management and Quality Management tracks.
- **Action:** 15 papers were submitted for the KM track for Prague and 12 were accepted, 11 papers have been confirmed for presentation at the session (1 was withdrawn).
- **Plan:** Ensure that there is a set of related papers from workshop participants at the 2011 IAC that exemplifies excellent knowledge management practices at aerospace organizations.
 - **Action:** Continue to support Quality and Knowledge Management Track for South Africa with a knowledge management track.
- **Plan:** Information is posted on a web site for each of communication and status reference.
 - **Action:** Group has an online collaboration workspace and discussion forum within Google groups. Additionally, final status reports and iterative versions of the paper are posted on the IAA web site.
- **Plan:** Coordination with other key working groups to understand issues and share lessons learned.
 - **Action:** Coordination continues with a variety of government and industry standards bodies as documented in previous notes.
 - **Action:** Seeking to find joint effort with the IAA Integrated Applications Working Group, perhaps in the area of utilizing space-related assets and knowledge for health. One-day workshop may be planned for this winter, either in Washington DC or Amsterdam.

Study Team Member Changes?

- No new members accepted at this time as the group is closing and transferring activities to the IAF Knowledge Management Committee.

Name of Persons Providing Study Group Status

- Jeanne Holm, Chief Knowledge Architect, NASA, Jet Propulsion Laboratory
- Roberta Mugellesi-Dow, ESOC

Status Report Date

- 26 September 2010